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UNITED STATES DEPARTMENT OF AGRICULTURE
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CHEMICAL-DUST SEED TREATMENTS FOR DENT CORN¹

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THE UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION
WITH THE ILLINOIS AGRICULTURAL EXPERIMENT STATION

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INTRODUCTION

For a number of years experiments have been conducted to determine whether or not disinfectants may be used to advantage on seed corn before planting. The purpose of such seed treatment is primarily to kill certain seed-borne parasites without injuring the seed. In the earlier experiments only treatments with chemicals in water solution were used. While some of these showed promise, they have proved to be inferior to the better dust disinfectants which have become available during the last few years. The dust treatments also have obvious advantages from the standpoint of convenience and safety of application. The purpose of the present circular is to make immediately available, in advance of the publication of the detailed results, the more important practical results of the experiments thus far conducted.

NEED FOR SEED-CORN TREATMENTS

Even the best seed lots of many high-yielding commercial strains of corn throughout the Corn Belt frequently carry an appreciable amount of infection with the ear-rot organisms, principally *Diplodia*, *Gibberella*, and *Basisporium*. The planting of seed carrying such infections may result in a reduced field germination, a blighting of the young plants, or a reduction in the vigor of the plants that survive. The extent of such infections in seed corn, as well as the reduction in yield following the planting of such seed, depends on

¹ Office of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, cooperating with the University of Illinois and Funk Bros. Seed Co., Bloomington, Ill. The Iowa data in Table 1 are published with the permission of the Iowa Agricultural Experiment Station.

many factors. In general, it may be said that damage caused by the seedling-blight diseases appears to be of greatest importance in the central, more humid areas of the Corn Belt.

SEED-TREATMENT COMPOUNDS COMMERCIALY AVAILABLE

While numerous compounds have been used in the experiments referred to above, only three of these compounds are commercially available at the present time. In all of these some form of mercury is the toxic ingredient. They are as follows:

BAYER DUST

Hydroxymercurinitrophenol sulphate.....	4 per cent
Inert material.....	96 per cent

Produced by The Bayer Co. (Inc.), New York, N. Y.

IMPROVED SEMESAN JR.

(Du Pont Dust No. 35-C)

Hydroxymercuri cresol.....	12 per cent
Inert matter.....	88 per cent

Produced by E. I. du Pont de Nemours & Co. (Inc.), Wilmington, Del.

MERKO

Mercury (metallic).....	Not less than 3.5 per cent
Inert ingredients.....	Not more than 96.5 per cent

Produced by the Corona Chemical Division, Pittsburgh Plate Glass Co., Milwaukee, Wis.

These names are furnished merely as information, and this does not imply any recommendation of the firms or their wares or any guaranty of their business standing or financial responsibility.

Not all organic and inorganic mercury dusts are satisfactory as seed-treatment compounds for seed corn. Many disinfectants, including numerous mercury compounds, have benefited the yield of corn from diseased seed. However, only a very few have benefited the yield from the diseased seed to the fullest extent and at the same time have not injured the growth and yield of corn from the good seed. Careful and extensive field experimentation is necessary to determine the merit of any particular chemical compound and the proper concentration of that compound to be used as a disinfectant for seed corn.

SEED TREATMENTS NOT EQUALLY BENEFICIAL TO ALL GRADES OF SEED CORN

The advantages and limitations of seed treatment are brought out in the data presented in Tables 1 to 4. It is very difficult to eliminate all diseased seed from any given lot of seed, even by the most careful selection and the use of the germination test. Thus even corn from well-selected, nearly disease-free seed may be benefited by seed treatment. This is especially true when early planting is followed by a period of cold wet weather. Under more favorable conditions following planting there may be no increases in yield as the result of the same seed treatment.

Increases in acre yield resulting from the treatment of well-selected but untested seed ranged from less than 1 bushel to 8.4 bushels, the mean increases ranging from 2.1 bushels to 5.4 bushels in the experi-

ments conducted in Illinois and from 3.7 bushels to 4.5 bushels in the experiments conducted in Iowa. (Table 1.)

TABLE 1.—*Mean acre yields of four varieties of yellow dent corn from good, tested, nearly disease-free seed, from equally well-selected untreated seed, and from seed known to be diseased (seed high in vitality but infected with Diplodia, Gibberella, and Basiporium) untreated and treated with Bayer Dust, Improved Semesan Jr., and Merko, in 1926 and 1927*

COOPERATIVE EXPERIMENTS¹ CONDUCTED IN THE FOLLOWING COUNTIES IN ILLINOIS: CHAMPAIGN, McLEAN, LOGAN, MARSHALL, PUTNAM, AND ROCK ISLAND

Year	Kind of seed	Seed-treatment compound used	Total number of replications	Acre yields (bushels)			
				Mean from seed—		Mean increase or decrease following treatment	
				Un-treated	Treated	Increase	Decrease
1926-27	Good tested.....	(Bayer Dust.....	136	63.3	64.1	0.8	-----
		(Improved Semesan Jr.....	136	63.2	65.1	1.9	-----
1927	Good untreated.....	(Bayer Dust.....	26	58.2	60.3	2.1	-----
		(Improved Semesan Jr.....	26	57.4	62.8	5.4	-----
1926-27	Diseased tested.....	(Bayer Dust.....	148	48.0	57.0	9.0	-----
		(Improved Semesan Jr.....	148	47.5	59.5	12.0	-----

EXPERIMENTS CONDUCTED AT AMES, IOWA

1927	Good tested.....	(Bayer Dust.....	30	37.1	36.7	-----	0.4
		(Merko.....	30	36.8	36.3	-----	.5
1927	Diseased tested.....	(Bayer Dust.....	50	30.6	35.6	5.0	-----
		(Merko.....	50	30.6	36.4	5.8	-----

COOPERATIVE EXPERIMENTS CONDUCTED IN THE FOLLOWING COUNTIES IN IOWA: O'BRIEN, CLAY, SHELBY, CERRO GORDO, AND BOONE

1927	Good untreated.....	(Bayer Dust.....	20	43.2	46.9	3.7	-----
		(Merko.....	20	50.5	55.0	4.5	-----

¹ For valuable assistance in the cooperative experiments credit is given to C. H. Checkly, F. E. Fuller, Claire V. Golden, and Joseph E. Johnson.

The fact that corn from diseased seed was benefited most by seed treatment should not be taken as an argument in favor of inferior seed. Such data show, first, that the purpose of seed treatment is primarily to kill certain seed-borne parasites, and second, that the increases in yield from seed treatment will depend largely on the percentage of kernels infected with the seedling-blight diseases.

SEED TREATMENT MORE BENEFICIAL TO PLANTINGS FOLLOWED BY UNFAVORABLE WEATHER

When corn planting is followed by a period of unfavorable weather the benefits from seed treatment are more pronounced than when the weather following planting is favorable. (Table 2.) Seed treatment with a satisfactory dust disinfectant makes possible early planting with a greater degree of safety from loss of seed and labor. Inasmuch as early planting is desirable to obtain the largest possible yields of well-matured corn, this advantage of seed treatments is of great practical importance. When late planting is followed by a period of warm, wet weather, seed treatments may be equally beneficial.

TABLE 2.—Mean acre yields of corn from good tested seed and from seed of average quality, untreated and treated with an organic-mercury dust, and planted on four different dates, on the University South Farm, Urbana, Ill., 1926

Quality of tested seed	Date of planting	Weather and soil conditions following planting	Acre yields (bushels)			
			Mean from seed—		Mean increase or decrease following treatment	
			Untreated	Treated	Increase	Decrease
Good-----	May 1	Favorable ¹ -----	51.3	50.8	-----	0.5
	May 11	Unfavorable ² -----	47.0	50.1	3.1	-----
	May 21	Moderately favorable ¹ -----	45.6	47.4	1.8	-----
	May 31	Favorable ¹ -----	45.2	45.1	-----	.1
Average-----	May 1	do. ¹ -----	44.3	45.0	.7	-----
	May 11	Unfavorable ² -----	43.3	49.2	5.9	-----
	May 21	Moderately favorable ¹ -----	43.0	46.1	3.1	-----
	May 31	Favorable ¹ -----	40.3	43.7	3.4	-----

¹ Relatively warm and soil moisture satisfactory.

² Cold and wet.

SEED TREATMENT MORE BENEFICIAL TO SOME VARIETIES THAN TO OTHERS

Varieties of corn differ in the degree to which they are benefited by seed treatment. (Table 3.) The yield of corn from the best seed of some varieties is increased by seed treatment. The yield of corn from seed of equal quality of other varieties is benefited very little by seed treatment. Again, the yield of corn from the same seed lots may be increased much more under some field conditions than under others, even in closely adjoining fields. (Table 4.)

TABLE 3.—Mean acre yields from good tested seed of three strains of yellow dent corn, untreated and treated with an organic-mercury dust, in experiments near Lincoln, Ill., 1927

Strain of corn	Acre yields (bushels)		
	Mean from seed—		Mean increase following treatment
	Untreated	Treated	
A-----	66.6	68.0	1.4
B-----	65.0	68.2	3.2
C-----	68.1	73.1	5.0

TABLE 4.—Mean acre yields from good tested seed of two strains of yellow dent corn, untreated and treated with an organic-mercury dust, both strains planted at approximately the same date on two different fields about 15 miles apart, near Henry and McNabb, Ill., respectively, in 1927

Location of experiment in Illinois	Strain of corn	Acre yields (bushels)		
		Mean from seed—		Mean increase following treatment
		Untreated	Treated	
Henry-----	{ A	60.6	63.7	3.1
	{ B	47.4	51.9	4.5
McNabb-----	{ A	64.4	65.0	.6
	{ B	55.9	56.7	.8

SEED TREATMENTS HAVE LIMITATIONS

Corn seed treatments can not be expected to take the place of good seed selection, proper storage, and constructive breeding. Nor can they take the place of an accurately conducted germination test in selecting corn of superior vigor. They are not effective in controlling corn smut. Seed treatments will not always be followed by an increase in yield. In no case can seed treatments be expected to bring dead seed to life, nor can they take the place of proper soil management. In fact the greatest actual increases in yield following seed treatments usually have occurred on the more productive soils and with the better strains of corn. However, the greatest percentage increases in yield may occur on the less productive soils and with the less productive strains.

DIRECTIONS FOR APPLYING DUST DISINFECTANTS TO SEED CORN

The dust disinfectant should be applied to the dry, shelled seed corn at the rate of approximately 2 ounces to the bushel. For applying the dust to seed corn, commercial or homemade dusters, such as are used for applying copper carbonate to wheat seed for preventing stinking smut,² are satisfactory. Avoid applying too much of the disinfectant. The dust should be thoroughly applied. Every kernel should be evenly covered with a thin coating of the dust. Screen off any excess dust that does not adhere to the surface of the kernels.

WARNING!

1. These dust disinfectants are poisonous.
2. Avoid inhaling the dust or getting any of it into the mouth.
Wear a dust mask over nose and mouth while making the treatments or work carefully in the open, keeping on the windward side of the machine.
3. Do not feed treated seed to poultry or other animals or mill for feed of any kind.

² For description of these, see TAPKE, V. F., and MEIER, F. C. COPPER-CARBONATE SEED TREATMENT FOR STINKING SMUT OF WHEAT. U. S. Dept. Agr. Misc. Circ. No. 108, 4 p., illus., 1927.

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